An Analysis of Depolarization Streaks for Anticipating Lightning in Thundersnow

Autumn Millard[1], Christopher Schultz[2], Kelley Murphy[1, 2], Sebastian Harkema[1, 2], Ryan Wade[1]

[1]Earth System Science Center, University of Alabama Huntsville, [2]NASA Short-term Prediction and Research Transition Center, Marshall Space Flight Center

Infrequent lightning events, particularly in stratiform precipitation, present a unique decision-support challenge to National Weather Service (NWS) forecasters and core partners. Anticipating thundersnow events, which are rare compared to warm season lightning, are especially difficult to anticipate due to slanted updrafts within the comma-head region of a mid-latitude cyclone. Researchers and operational forecasters have observed depolarization streaks in differential reflectivity (ZDR) as a result of ice crystal layers prior to thundersnow initiation. These depolarization streaks form as a result of ice crystals aligning themselves with enhancements in the electric field in stratiform precipitation and are associated with ZDR values near zero. During the 7 March 2018 winter storm, a teacher in New Jersey was struck by lightning while dismissing students and depolarization streaks were observed in weather radar observations. Therefore, it is advantageous to examine depolarization streaks in ZDR to determine whether it can be used to anticipate lightning potential in winter-time events. Multiple events will be analyzed using the National Lightning Detection Network (NLDN) and the Geostationary Lightning Mapper (GLM) to determine if thundersnow flashes coincide with ZDR depolarization streaks in weather radars. This study also expands on collaboration between the NWS Huntsville Forecast Office and NASA Short-term Prediction Research and Transition (SPoRT) program to determine how depolarization streaks can be used operationally to anticipate lightning within stratiform regions. Preliminary work has indicated noticeable potential in correlating depolarization streak as a precursor to thundersnow flashes in a variety of geographical regions.